Amendments to the Specification

Please replace the following paragraphs as shown below.

[0042] FIG. 1 illustrates a conventional optical reduction system. From its long conjugate end where the reticle is placed to its short conjugate end where the wafer is placed, it possesses a first optical component group 120, a beamsplitter cube 150, a first quarter-wave plate 140, a concave mirror 130, a second quarter-wave plate 160, and a second optical component group 170. Each of these components 120 - 170 are described further in U.S. Pat. No. 5,537,260 entitled "Catadioptric Optical Reduction System with High Numerical Aperture" issued Jul. 16, 1996 to Williamson (incorporated herein by reference). A feature of any optical system is the interdependence of numerical aperture size and spectral radiation requirements. In order to efficiently illuminate the reticle, linearly polarized light may be desired. For example, a light source 102 can be used. In some cases, other illumination polarization states, for example right or left hand circular polarization, may be desired. The limitations of linearly or nearly linearly polarized light are introduced above and discussed in the following sections.

[0047] However, another class of crystals exhibits asymmetric (or anisotropic) optical properties. They are known as birefringent crystals. One birefringent type is uniaxial, meaning that one crystal axis is different from the other two: $nz \neq$ ⊟ $nx = ny$. Common uniaxial crystals of optical quality are quartz, calcite and MgF2 . The single crystal axis that is unique is often called the "extraordinary" axis, and its associated refractive index is labeled ne, while the other two axes are "ordinary" axes with index no.

[0065] In one embodiment, for dose control, the polarization state can be evaluated over the exposure. For example, the polarization state can be averaged over the reticle. Fig. 3 illustrates an embodiment of the present invention that eliminates such asymmetries or print biases. Fig. 3 shows a first optical component group 320, a beamsplitter cube 350, a first quarter-wave plate 340, a concave mirror 330, a second

quarter-wave plate 360, a second optical component group 370, and a wafer 380. A light source 302 is also shown, which can be similar to light source 102 shown in Figure 1 or light sources 402, 502, 602, 702, 802, and 902 shown in respective Figures 4-9. A Berek's compensator 305 is introduced before the object or reticle plane 110. Berek's compensator 305 fine-tunes the light in the reticle plane polarization so that it more closely matches the desired state at the reticle plane. In one embodiment, where there is a loss free optical illumination system, the compensator introduces a correction to the polarization that is equal to the polarization error without the compensator. The correction is the departure from the desired state but with the opposite sign. If the projection optic has a small unintended amount of birefringence before any strong polarizers, then the illumination compensator can be offset an additional amount to compensate for this birefringence. Thus, the dose errors caused by the birefringence of the reticle are minimized and linewidth CD control improved.

[0066] It is also apparent to one skilled in the relevant art that a Soleil-Babinet compensator 405 could be inserted into the system before reticle 110 in place of Berek's compensator 305. This embodiment is shown in Fig. 4 where Soleil- Babinet compensator 405 serves the same function as Berek's compensator 305 and performs within the same general characteristics, as discussed above. Fig. 4 also shows a first optical component group 420, a beamsplitter cube 450, a first quarter-wave plate 440, a concave mirror 430, a second quarter-wave plate 460, and a second optical component group 470.

[0078] A wider spectral bandwidth can be achieved by the use of two optical materials with different dispersions. A second embodiment of the present invention is illustrated in Fig. 6. From its long conjugate end, it comprises a first quarter-wave plate 605 ~~608~~, an object or reticle plane 110, a second quarter-wave plate 611, a lens group LG4, a folding mirror 622, a lens group LG5, a beamsplitter cube 632 having surface 638, a first quarter-wave plate 634, a concave mirror 636, a second quarter-wave plate 640, and lens group LG6. The image is formed at image or wafer plane 180. The lens group LG4 comprises a spaced doublet including negative lens 612 and positive lens 614, a weak positive lens 616, positive lens 618, and shell 620. The lens group LG5

comprises a positive lens 624, a negative lens 626, a positive lens 628, and a negative lens 630. The lens group LG6 comprises two positive lenses 642, cemented doublet including positive lens 644 and negative lens 646, positive lens 648, and cemented doublet including shell 650 and positive lens 652.

[0084] Fig. 8 illustrates a fourth embodiment of the optical reduction system of the present invention. This embodiment has a numerical aperture of 0.63 and can operate at a spectral bandwidth of 300 picometers, and preferably of 100 picometers, centered on 248.4 nanometers. From the long conjugate end, it includes an object or reticle plane 110, a first lens group LG1, a folding mirror 820, a second lens group LG2, a beamsplitter cube 830, a first quarter-wave plate 832, a concave mirror 834, a surface 836 of beamsplitter cube 830, a second quarter-wave plate 838, and a third lens group LG3. The image is formed at the image or wafer plane 180.

[0090] Fig. 9 illustrates a fifth embodiment of the optical reduction system of the present invention. Preferably, this embodiment has a numerical aperture of 0.60 and operates at a spectral bandwidth of 300 picometers centered on 248.4 nanometers. From the long conjugate end, it includes a variable wave plate 905 within the illumination system, an object or reticle plane 110, a first lens group LG1, a folding mirror 920, a second lens group LG2, a beamsplitter cube 930, a first quarter-wave plate 932, a concave mirror 934, a surface 936 of beamsplitter cube 930, a second quarter-wave plate 938, and a third lens group LG3. The image is formed at an image or wafer plane 180.